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CADRE EVALUATIONS OF THE RIFLE LASER AND RIMFIRE ADAPTER RIFLE MARKSMANSHIP TRAINING DEVICES.

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The Rifle Laser/Rimfire Adapter Evaluation was conducted by the TRADOC Combined Arms Test Activity. Test issues and the test experimental design were prepared by the ARI Field Office at Fort Benning and provided to TCATA through the office of DTD/USAIS.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents results of questionnaires administered to cadre during the Rifle Laser/Rimfire Adapter Evaluation (RL/RFA) conducted by the TRADOC Combined Arms Test Activity (TCATA) at Fort Jackson, S.C., during the spring of 1977. The RF/RFA test was a comparative evaluation of the training effectiveness of two training devices under conditions involving the use of four different amounts of ammunition.

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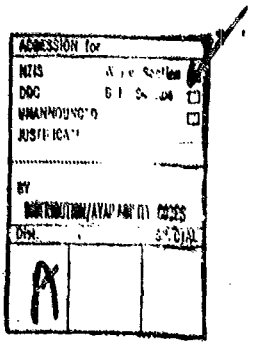

Research Report 1186

CADRE EVALUATIONS OF THE RIFLE LASER AND RIMFIRE ADAPTER RIFLE MARKSMANSHIP TRAINING DEVICES

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Training Effectiveness Analysis

ARI Research Reports and Technical Papers are intended for sponsors of R&D tasks and other research and military agencies. Any findings ready for implementation at the time of publication are presented in the latter part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or Disposition Form.

FOREWORD

The research reported here was performed jointly by the Army Research Institute, Fort Benning and Fort Hood Field Units. It is part of an ongoing program of research directed toward development of cost effective methods for individual and collective training. This program includes research on multiple aspects of the design, development, evaluation, and integration of cost and training effective training systems for the Army.

This report presents results of questionnaires administered to cadre during the Rifle Laser (RL)/Rimfire Adapter (RFA) Evaluation conducted by the Training and Doctrine Command (TRADOC) Combined Arms Test Activity (TCATA) at Fort Jackson, S.C., during the spring of 1977. The questionnaires were designed and administered in response to a request by the U.S. Army Infantry School (USAIS) for support of the TRADOC-sponsored field test. The support was provided as part of the Training Effectiveness Analysis, a training developments project for M16A1 rifle marksmanship sponsored by USAIS. Additional test support provided by ARI included preparation of the Outline Test Plan and experimental design used in the test, review and monitoring of test quality control measures on behalf of USAIS and consultation to TCATA on data interpretation and preparation of their final report.

The RL/RFA test was a comparative evaluation of the training effectiveness of two training devices under conditions involving the use of four different amounts of ammunition. TCATA has reported their analysis of the training effectiveness of the devices based on trainee performance data (TCATA Test Report FM 364B). The current report supplements the TCATA report, providing a summary of the cadre's evaluations of the training devices and opinions on related rifle marksmanship issues. A subsequent ARI report will present the trainee's evaluations of the two training devices. This and other ARI research in support of the M16A1 Training Effectiveness Analysis has been greatly facilitated by personnel in the Directorate of Training Developments, USAIS, particularly MAJ John Callaway.

Substantial assistance was provided by SP5 James Viney during the data reduction and analysis phases of this project. MAJ Charles Woodruff and his staff in the Rifle Laser/RFA Evaluation Directorate administered the questionnaires. All automatic data processing (ADP) data was done at TCATA. Mr. Jack Morris, Mr. James Kirksey, and Ms. Gale Shull from the ADP section at TCATA provided responsive support.

The project was conducted as part of Army Project 2Q763731A773, FY 76 Work Program, and RDTE Project 2Q763743A773, FY 77. It was directly responsive to the requirements of the USAIS and TRADOC.

JOSEPH ZEIDNER
Technical Director (Designate)

CADRE EVALUATIONS OF THE RIFLE LASER AND RIMFIRE ADAPTER RIFLE MARKSMANSHIP TRAINING DEVICES

BRIEF

Requirements:

To determine the attitudes of cadre toward the Rifle Laser (RL) and Rimfire Adapter (RFA) rifle marksmanship training devices.

Procedure:

Pretest and posttest questionnaires were given to 71 male and female officers and noncommissioned officers (NCOs) who participated in the Rifle Laser/Rimfire Adapter test at Fort Jackson, S.C. (spring of 1977). Respondents represented both Basic Rifle Marksmanship (BRM) committee group cadre and company cadre. Topics addressed were the content of BRM, an evaluation of the RFA, an evaluation of the RL, and background information on the respondents.

Findings:

In contrast to opinions obtained during the Basic Rifle Marksmanship Test (spring of 1976), cadre now consider the 37-hour, 334-round BRM program of instruction generally to be adequate in hours of instruction and number of rounds fired. They also now accept a 5.2-cm shot group size as an appropriate standard for zeroing the M16 rifle.

The RFA was evaluated very positively and recommended for adoption in the Marksmanship Fundamentals phase of rifle marksmanship training. A notable problem with the RFA, however, was an unacceptable frequency of weapon malfunctions.

The evaluation of the RL was decidedly more mixed, and its training effectiveness was not judged to be equivalent to that of live fire. There was considerable disagreement over the accuracy and sighting characteristics of the RL versus the M16 rifle. Characteristics that were frequently perceived to present training disadvantages were lack of recoil and noise, inability to determine the location of misses, and a trigger squeeze that differed from that of the M16 rifle. Cadre were also concerned about lesser safety consciousness among trainees who train with the RL.

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Utilization of Findings:

The data in this report should serve as input to decisions concerning fielding either the RFA or the RL. They should also be used when considering design modifications to either device. The data also have relevance to research and development projects on similar training devices, such as the Marksmanship and Gunnery Laser Device (MAGLAD).

CADRE EVALUATIONS OF THE RIFLE LASER AND RIMFIRE ADAPTER
RIFLE MARKSMANSHIP TRAINING DEVICES

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CADRE EVALUATIONS OF THE RIFLE LASER AND RIMFIRE ADAPTER RIFLE MARKSMANSHIP TRAINING DEVICES

BACKGROUND

Currently, during Basic Training all Army recruits receive rifle marksmanship training with the M16A1 rifle using 5.56mm ammunition. The present Basic Rifle Marksmanship (BRM) Program of Instruction (POI) requires 334 rounds of 5.56mm ammunition per trainee (USAIS, 1977a). At an approximate cost of 8¢ per round, BRM entails an annual expenditure of approximately $6 million for ammunition in the training base (USAIS, 1977b). Additional ammunition costs are incurred during the Combat Indoctrination phase of Basic Training, in Advanced Individual Training courses, and in unit training activities.

The Rifle Laser (RL) and Rimfire Adapter (RFA) training devices offer the potential for significantly reducing the amount of 5.56mm ammunition consumed annually during the firing of the M16A1 rifle. These training devices could conceivably be fired as substitutes for some or all of the firing of 5.56mm ammunition, thereby reducing the training costs without reducing the overall effectiveness of marksmanship training.

The RL device was developed by the U.S. Army Training Support Center. It consists of a narrow-beam laser mounted on a demilitarized M16 rifle. It also includes a battery power source and a trigger-pull counter located within the stock. The gallium arsenide laser assembly is positioned externally on the top of the barrel, flush against and below the front sight. Each time the trigger is pulled, a discrete burst of laser energy is emitted from the device. The RL is fired at targets that have laser sensors arranged in such a way that the firer must assume the same sight picture with the RL that he would normally assume with the M16A1 rifle firing 5.56mm ammunition in order to register a hit on a target (NTEC, 1977). The RL is individually zeroed, i.e., the laser is adjusted so that the point of aim and strike of the laser beam coincide for each soldier (Woodruff et al., 1977.

The RFA permits the firing of .22 caliber ammunition by the M16A1 rifle in place of 5.56mm ammunition. In contrast to 5.56mm ammunition, .22 caliber ammunition costs approximately 1¢ per round (TRADOC, 1976). The RFA consists of a replacement bolt for the standard M16 bolt assembly and a magazine adaptor that fits inside the standard M16 magazine. Previous research has shown that the flight characteristics of .22 caliber rounds fired from the M16A1 rifle using the RFA are virtually identical to the flight characteristics of 5.56mm rounds fired from the M16A1 rifle out to a distance of 42 meters (Oliver and Venti, 1975).

Both rifle marksmanship lasers and the RFA have undergone prior training effectiveness evaluations. HumRRO (1971a,b) tested an RL in both the institutional and unit training environments, but test design and equipment problems produced inconclusive test results. Another test with an RL system was conducted in 1976, again producing inconclusive results (Fort McClellan ATC, 1976). The U.S. Army Infantry Board (Oliver and Venti, 1975) evaluated the RFA for use in individual skill training in the unit training environment and found it to be an effective device for use in refresher training. The Infantry Board recommended that the RFA be used for firing against targets at ranges out to 75m and concluded that RFA was well suited for use in the Marksmanship Fundamentals phase of training, including Battle Sight Zero. That test, however, did not directly evaluate the use of the RFA for initial skills training during BR.

In the spring of 1977 the U.S. Army Training and Doctrine Command Combined Arms Test Activity (TCATA) conducted the Rifle Laser/Rimfire Adapter Evaluation at Fort Jackson, South Carolina. The purpose of the test was to evaluate the training effectiveness of the RL and RFA in BRM training. Six male and two female Basic Training companies participated in the test. Three of the principal variables were use of a training device during the Marksmanship Fundamentals and Battle Sight Zero phases of training, use of a training device during the Field Fire and Record Fire phases of training, and the number of rounds fired during the Field Fire and Record Fire phases of training. The test used a factorial design through which all possible combinations of the three variables were evaluated. During the Marksmanship Fundamentals and Battle Sight Zero phases of training, some trainees used the M16A1 rifle with the RFA, using .22 caliber ammunition, while other trainees used the M16A1 rifle with 5.56mm ammunition. Likewise, during the Field Fire and Record Fire phases of training, some trainees used the RL while other trainees used the M16A1 rifle with 5.56mm ammunition. Also, during the Field Fire and Record Fire phases of training, trainees fired one-half, one, or four times the current authorized number of rounds (150 rounds). In addition, some trainees went directly from the Battle Sight Zero phase of training to the posttest Record Fire. In effect, these trainees fired zero rounds during the Field Fire and Record Fire phases of training. Following their prescribed training program, all trainees fired a posttest Record Fire using an M16A1 rifle with 5.56mm ammunition.

PURPOSE

The purpose of this report is to present the results of an evaluation of the cadre's expressed opinions and attitudes toward the RL and RFA during the Rifle Laser/Rimfire Adapter Evaluation. This report is based upon the results obtained from pretraining and posttraining questionnaires. The present report supplements the TCATA Rifle Laser/Rimfire Adapter Evaluation test report. The TCATA report focuses on

trainee performance data and hardware reliability but does not formally address user attitudes.

METHOD

Pretest and posttest questionnaires were administered to 71 cadre members. The majority of items were in an objective format; there were some open-ended comment items in the posttest questionnaire. Topics addressed were the content of BRM, an evaluation of the RFA, an evaluation of the RL, and background information on the respondents. Respondents represented BRM Committee Group and company cadre.

CONCLUSIONS

Content of BRM Training

Number of Rounds. In general, the cadre believed that the number of hours and rounds provided for instruction by the 37-hour POI were "about right." Out of seven questions that pertained to the adequacy of hours and rounds scheduled in the 37-hour POI, five exhibited statistically significant pretest-posttest changes. In these cases opinion shifted from saying the POI needed "slightly more" hours and rounds to saying the POI was "about right." The cadre also judged one-half the rounds authorized by the 37-hour POI to be too few and four times to be too many.

These results indicate that the cadre found the amount of instruction given during the 37-hour BRM POI to be adequate. Opinion data collected from cadre during the conduct of the BRM Test, however, revealed a strong belief that the 37-hour POI provided an inadequate number of hours and rounds for instruction (Tierney & Cartner, 1977). Because both sets of data were collected from cadre at Fort Jackson, S.C., this change in opinion suggests that experience with the 37-hour POI probably has promoted its acceptance among the trainers. This conclusion is consistent with the pretest-posttest attitudinal shifts noted above.

Consistent with the BRM Test data, the cadre judged the time provided for instruction in the Mechanical Training and Marksmanship Fundamentals phases of training to be somewhat less adequate than the time provided for Field Fire and Record Fire. This judgment reflects the relative importance placed on these blocks of instruction by the cadre (Tierney and Cartner, 1977).

Shot Group Size. In the posttest questionnaire, 60% of the cadre responded that a 5.2-cm circle was an appropriate standard for use in

zeroing the M16 rifle.[1] Only 9% of the respondents to the RL/RFA questionnaires still favored the old standard of 3.0 cm. This figure compares to 45% of the cadre who favored the 3.0-cm standard at the end of the BRM Test (Tierney & Cartner, 1977).

Evaluation of the Rimfire Adapter

Training Effectiveness. The cadre liked the RFA for use in BRM training; in fact, 73% of the respondents recommended its adoption. Physical differences between firing the M16 with 5.56mm ammunition versus the RFA with .22 caliber ammunition were not judged to have negative effects on training. Some of the differences between firing 5.56mm and .22 caliber ammunition were that the .22 caliber ammunition produced "moderately less" noise and recoil. Also, zeroing the M16 rifle with the RFA and .22 caliber ammunition was perceived as "slightly less difficult" than zeroing the M16 with 5.56mm ammunition. Five cadre members commented that they considered firing 5.56mm ammunition to be more realistic. Five others, however, commented that the lesser noise and recoil of the .22 caliber produced less fear in trainees and a stronger tendency for trainees to correctly apply rifle marksmanship skills. Twelve others stated that the lower noise and/or recoil were advantageous but did not explain this opinion.

The training effectiveness of the RFA with .22 caliber ammunition and the M16 with 5.56mm ammunition in the Marksmanship Fundamentals and Battle Sight Zero phases of instruction were rated as equivalent. Regardless of ammunition type used, the cadre believed that 18 rounds were "about right" for Battle Sight Zero and that the typical trainee was "fairly sure to zero" his M16 rifle. The RFA was rated "about the same" for teaching Marksmanship Fundamentals as teaching with 5.56mm ammunition, and requirements for reinforcement training were viewed as approximately equal in the two cases. Cadre believed use of the RFA would have "no effect," either positive or negative, on trainee motivation. Eighty-four percent of the respondents believed trainees could transfer their training from the RFA to firing 5.56mm ammunition. Finally, the cadre rated the accuracy, at 25 m, of the M16 rifle with the RFA and .22 caliber ammunition as the same as the accuracy with 5.56mm ammunition. According to 72% of the respondents, the aiming points were the same.

Malfunctions. The primary problem with the RFA noted by the cadre was an unacceptable frequency of jamming and feeding problems. Seventy-nine percent of the cadre said these problems increased in frequency when the RFA was used. Such problems were "very much

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[1] This new standard was implemented for Army-wide use (USAIS, 1977a) on the basis of data collected during a side test to the BRM Test (USAIS, 1976).

more" frequent in the opinion of 33% of the respondents. This judgment was affirmed in the comment items, where weapon malfunctions were the most frequent negative criticism of the RFA.

Evaluation of the Rifle Laser

Training Effectiveness. The cadre did not like the RL for use in BRM training to the same degree they liked the RFA. For example, it was "slightly worse" for use in Field Fire training than use of the M16 rifle with 5.56mm ammunition. Similarly, the RL was "slightly bad" for use in Record Fire qualification. These attitudes existed prior to the test and were not changed by training experience with the RL system. Fifty-seven percent of the cadre recommended use of the RL during Field Fire training, and only 38% recommended its use in Record Fire. If scaled-down ranges were available at the unit, 58% said they would use the RL for reinforcement training.

Sixty-four percent of the cadre believed trainees trained with the RL could successfully transfer their training to the M16 rifle, firing 5.56mm ammunition. They also believed, however, that trainees receiving training with the RL would do "slightly worse" on Record Fire with the M16 rifle and 5.56mm ammunition. This opinion was consistent with the test results reported by TCATA (Woodruff et al., 1977), which were based on Record Fire performances. The cadre expressed a similar opinion in response to questions concerning confidence that trainees could hit targets at various ranges. For example, for the 25-200-m range band, they believed that soldiers trained with the M16 and 5.56mm ammunition were more likely to hit man-sized targets firing the M16 with ball ammunition than were soldiers trained with the RL.

Prior to the test, the cadre believed those trained with the RL would require more reinforcement training than those trained with the M16 rifle firing 5.56mm ammunition. After the test, however, the need for reinforcement training was perceived to be about equal regardless of whether training occurred with the RL or the M16 rifle. The number of rounds or trigger pulls required for effective training with the RL and with the M16 rifle and 5.56mm ammunition were also judged to be "about the same." Similarly, no differences were seen in case of conducting RL versus live fire training, nor did use of the RL seem to have differential effects on trainee motivation.

As the preceding paragraphs show, the evaluation of the training effectiveness of the RL was decidedly mixed.

Characteristics of the Rifle Laser. The cadre found the accuracy of the RL "about the same" as accuracy of the M16 firing 5.56mm ammunition. There also were no perceived differences in difficulty of sighting the two systems. The aiming points were not the same,

however, according to 37% of the cadre; 12% were not certain whether the aiming points were the same. The cadre believed it was "slightly less difficult" to hit targets with the RL than with the M16 firing ball ammunition. Firing the RL was judged to be "slightly unrealistic"; this opinion had changed from pretest opinions, when the cadre anticipated the RL would be "moderately unrealistic." Forty-one percent of the cadre believed differences in trigger squeeze between the RL and the M16 would make it harder for the RL-trained soldier to fire the M16 with ball ammunition. The RL was judged to be lighter than the M16. This response was midway between "about the same" and "slightly lighter." Balance of the RL was rated as "about the same" as balance of the M16.

Comments. Because the cadre's ratings of the RL were somewhat equivocal, their comments provide important additional information in the subjective evaluation of the RL system. The most frequently noted "like" (approval) was that the system was quieter (11 out of 71 respondents offered this comment). Presumably this perceived advantage is related to the opinion that the RL system helps the trainee gain confidence with the weapon. Twenty cadre members, however, said they did not like the RL's lack of noise and recoil. Eight respondents noted the inability to determine location of misses with the RL, and 5 respondents stated trainees were less safety-conscious with the RL (see Table 14 for other comments). The most frequently recommended improvement for the RL, suggested by 4 of 71 respondents, was strengthening the lower receiver (Table 15). In comments on motivational and handling problems, 17 cadre members said trainees using the RL were not mindful of safety precautions, but 5 others said there were no significant motivational problems associated with use of the RL. Six said trainees did not learn the basics of rifle marksmanship with the RL, including how to correct their fire after misses (Table 16). When asked to compare sighting and accuracy of the RL and the M16, 12 said the sight pictures were comparable, but 7 said the aiming points were different or the laser was more accurate, particularly at longer ranges.

Summary

Content of BRM. A change in attitudes among the cadre at Fort Jackson, S.C., concerning length of BRM training developed from the time of the BRM Test (spring 1976) through the conduct of the RL/RFA Test (spring 1977). The cadre now believe the hours and rounds provided for instruction in the 37-hour POI are generally adequate. Their ratings of individual phases of training, however, still indicate that the Mechanical Training and Marksmanship Fundamentals phases are the most important phases and possibly require somewhat more instructional time. The vast majority of cadre now favor the 5.2-cm standard for zeroing the M16 rifle.

Rimfire Adapter. The cadre evaluation of this training device was very positive and acceptance of it was high. Many commented on the potential training advantages of use of a low-noise, low-recoil system early in marksmanship training. A notable problem with the RFA was an unacceptable frequency of weapon malfunctions.

Rifle Laser. The evaluation of the RL was decidedly more mixed. Its training effectiveness was not judged equivalent to that of live fire, although responses to some questions showed exceptions to this judgment (e.g., amount of reinforcement training, number of rounds or trigger pulls needed for effective training, and effect on trainee motivation). The general opinion was that trainees using the RL would not be quite as well trained as those using the M16 rifle with 5.56mm ammunition. The majority of the cadre was against use of the RL for Record Fire, and only 57% recommended its use in Field Fire (compared to 73% recommending the RFA for use in Marksmanship Fundamentals).

There was considerable disagreement over the accuracy and sighting characteristics of the RL versus the M16 rifle. Accuracy and difficulty of sighting were rated about the same for each, but 49% did not believe or were not certain whether aiming points were the same. This uncertainty was reflected in the open-ended comment items. Many believed the RL led to less safety consciousness among trainees. Lack of noise, recoil, and inability to determine locations of misses were other frequently noted training disadvantages. Finally, a high percentage of cadre members believed differences in trigger squeeze between the RL and the M16 rifle would produce training problems.

RECOMMENDATIONS

Rimfire Adapter. The subjective evaluation of the RFA suggests that it should be adopted for use in the Marksmanship Fundamentals phase of BRM training. This evaluation appears to be consistent with the results of the analysis of the trainee performance data (Woodruff et al., 1977).

The RFA should be redesigned or modified to decrease its malfunction rate, or use procedures should be developed that will produce such a decrease in its malfunction rate.

Rifle Laser. The subjective evaluation of the RL suggests that the training effectiveness of the RL during the Field Fire and Record Fire phases of BRM training is less than the training effectiveness of the M16 rifle with 5.56mm ammunition. This evaluation appears to be consistent with the results of the analysis of the trainee performance data (Woodruff et al., 1977).

The RL should not be introduced into BRM training until a number of outstanding issues are resolved and further refinements are made in the hardware. Among the outstanding issues requiring additional research are the mixing of laser firing and live firing during BRM training, the accuracy of the RL, the fidelity of the RL aiming point, and the contribution of recoil and noise to the training effectiveness of the RL.

The RL/RFA Test data base provides a good starting point for studying the mixing of laser firing and live firing during BRM. It appears that the RL may offer the greatest potential as a training device when employed in conjunction with live firing during BRM training.

The accuracy of the RL and fidelity of the aiming point compared to the M16 should be resolved. Special emphasis should be placed on fidelity of simulation at longer range targets.

Operational testing of the Marksmanship and Gunnery Laser Device (MAGLAD) should determine whether recoil and noise make a measurable contribution to the training effectiveness of rifle laser training devices. This marksmanship laser training device is currently under development. Potential advantages of the MAGLAD system compared to the current RL system are the capability for blank firing and a bore sighting kit for easy adjustment of the strike of the laser beam to the individual soldier's aiming point.

Consideration should be given to strengthening the lower receiver of the RL.

TECHNICAL SUPPLEMENT

METHOD

Research Design and Questionnaries

Questionnaires were administered to cadre members prior to and immediately after their participation in the TCATA test. The pretraining questionnaire contained 51 items, all in an objective format. The majority of the items contained 5- or 7-point rating scales. The posttraining questionnaire had 65 items, 5 of which were open-ended comment items. This questionnaire contained 34 items that were repeated from the pretraining questionnaire. Topics addressed were the content of BRM, evaluation of the RFA, evaluation of the RL, and background information of the respondents.

Population

The cadre completing the questionnaires represented two groups: cadre from the eight Basic Training companies who participated in the test, and members of the BRM Committee Group who were actively teaching in the Marksmanship Fundamentals, Field Fire, or Record Fire phases of BRM. The pretraining questionnaire was completed by 70 individuals, and the posttraining questionnaire, by 71 individuals. Out of the 70 respondents to the pretraining questionnaire, 67 of these individuals completed the posttraining questionnaire. These samples represented approximately 90% of the target BRM committee group population and cadre from companies participating in the test.

The average cadre member had completed some college work, had been in the Army about 10 years, and had about 1 year combat experience. The typical respondent had been assigned to a Basic Training Center approximately 1 to 2 years and had 6 to 12 months experience teaching BRM. Table 1 provides further data describing the composition of the sample. None of these background characteristics showed a consistent relationship with attitudes expressed toward BRM, the RL, or the RFA.

Data Collection

All BRM Committee Group cadre received the pretaining questionnaire prior to the start of BRM training for the pilot test company. They received the posttraining questionnaire after all test companies had completed participation in the test. In both cases, the questionnaires were administered in a single session at the test headquarters by a trained data collector.

Table 1

Composition of Test Sample

Characteristic	Percentage
Officers	23
Noncommissioned officers	77
Males	84
Females	16
Company cadre	83
BRM committee group	17
Fired M16 rifle in combat	56
Qualified as expert with M16 rifle	73

The company cadre received the pretraining questionnaire prior to period 1 of BRM training and completed these questionnaires while the trainees were completing the Trainee Pretraining Questionnaire. The company cadre completed the posttraining questionnaire after their company had completed participation in the test.

RESULTS

The analysis of the cadre responses to the pretraining and posttraining questionnaires was accomplished in three ways: (a) by analyzing the responses to individual items on the posttraining questionnaire, (b) by comparing the responses to similar items that appeared on both the pretraining and posttraining questionnaires, and (c) by comparing the responses to each item in specific pairs of items on the posttraining questionnaire. When statistical comparisons were made between the mean response to an item on the pretraining questionnaire and the mean response to the comparable item on the posttraining questionnaire, a one-way analysis of variance with repeated measures was employed. The same approach was taken in comparing the mean response to an item in the posttraining questionnaire with the mean response to another item in the posttraining questionnaire. The alpha level was set at .05 in all of the statistical tests reported in this section, although the actual probabilities of significant differences are reported. The results are organized into three sections: Content of BRM Training, Evaluation of the Rimfire Adapter, and Evaluation of the Rifle Laser.

Content of BRM Training

In both the pretraining and posttraining questionnaires, the cadre responded to a number of items that required opinions concerning the content of BRM training. The 37-hour BRM program of instruction was employed during the Rifle Laser/Rimfire Adapter Evaluation (see Table 2), although the Automatic Fire and Night Fire phases of training were not included in the evaluation.

Table 2

37-Hour BRM POI

Training phase	Hours of instruction	Number of rounds
Mechanical training	4	0
Marksmanship fundamentals (including zeroing)	10	42
Field fire	12	118
Record fire	5	40
Automatic fire	3	45
Night fire	3	89
Total	37	334

Hours of Instruction. The pretraining and posttraining questionnaires requested the cadre to rate whether more or fewer hours of instruction are needed than are specified in the first four blocks of instruction.

The following 7-point scale was used:

Very much more	A good deal more	Slightly more	About right	Slightly less	A good deal less	Very much less
1	2	3	4	5	6	7

The results are presented in Table 3.

Table 3

Hours of Instruction

Question	Mean response: Pretraining	Mean response: Posttraining	Significant pre/post change
Do you feel that trainees need more or less than 4 hours of instruction during the Mechanical Training phase of training?	3.15	3.48	Yes $F(1,64) = 4.71$ $p < .034$
Do you feel that trainees need more or less than 10 hours of instruction during the Marksmanship Fundamentals (including zeroing) phase of training?	3.44	3.51	No
Do you feel that trainees need more or less than 12 hours of instruction during the Field Fire phase of training?	3.59	3.97	Yes $F(1,64) = 6.66$ $p < .012$
Do you feel that trainees need more or less than 5 hours for Record Fire qualification?	3.54	3.89	Yes $F(1,64) = 8.14$ $p < .006$

Number of Rounds Fired. Both the pretraining and posttraining questionnaires asked the cadre if they thought that the trainees should fire more or less than the total of 334 rounds specified in the 37-hour POI. The following 7-point scale was used in these items:

Very much more	A good deal more	Slightly more	About right	Slightly less	A good deal less	Very much less
1	2	3	4	5	6	7

The pretraining and posttraining mean responses to these items were 3.44 and 3.72, respectively. A statistical comparison revealed no significant difference between the two means.

The number of rounds fired during the Field Fire and Record Fire phases of training was systematically manipulated in the Rifle Laser/Rimfire Adapter Evaluation. Some trainees fired the standard number of rounds called for in the Field Fire and Record Fire phases of the 37-hour POI, and other trainees either fired one-half that number of rounds or four times that number of rounds. Trainees who fired half the number of rounds were presented only half the standard number of targets. Trainees who fired four times the number of rounds were presented four times the standard number of targets. The same 7-point scale as above was used in these pretraining and posttraining questionnaire items concerning the number of rounds fired.

The results from the questionnaire items concerning the number of rounds that should be fired during Field Fire are presented in Table 4. The results from the items concerning the number of rounds that should be fired during Record Fire are contained in Table 5.

Table 4

Number of Rounds During Field Fire

Question	Mean response		Significant pre/post change
	Pretraining	Posttraining	
Do trainees need to fire:			
One-half the POI number of rounds (59 rounds)	2.90	2.98	No
Full POI number of rounds (118 rounds)	3.61	3.92	Yes $F(1,65) = 4.87$ $p < .031$
Four times the POI number of rounds (472 rounds)	4.83	5.08	No

Table 5

Number of Rounds During Record Fire

Question	Mean response: Pretraining	Mean response: Posttraining	Significant pre/post change
Do trainees need to fire:			
One-half the POI number of rounds (20 rounds)	2.91	2.94	No
Full POI number of rounds (40 rounds)	3.52	3.80	Yes $F(1,63) = 7.39$ $p < .008$
Four times the POI number of rounds (160 rounds)	4.88	5.39	Yes $F(1,64) = 6.74$ $p < .012$

Shot Group Size. Currently a 5.2-cm shot group is used for zeroing the M16 rifle during BRM. Both the pretraining and posttraining questionnaires asked the cadre which shot group size is best for BRM training. The results from these items are presented in Table 6.

Table 6

Shot Group Size Preference for BRM Training

Shot group size	Percentages of respondents: Pretraining	Percentages of respondents: Posttraining
7.5 cm or larger	13	10
5.2 cm	58	69
4.4 cm	13	11
3.0 cm	15	9
1.5 cm	1	1

Evaluation of the Rimfire Adapter

In both the pretraining and posttraining questionnaires, the cadre responded to a number of items which involved the characteristics of the usage of the rimfire adapter (RFA) during 25-meter training.

Zeroing. Both the pretraining and posttraining questionnaires asked the cadre how sure they were that trainees can zero the M16 rifle following Marksmanship Fundamentals using either .22 caliber or 5.56mm ammunition. The following 7-point scale was used in rating these items:

Extremely sure to zero	Very sure to zero	Fairly sure to zero	Might or might not zero	Fairly sure not to zero	Very sure not to zero	Extremely sure not to zero
1	2	3	4	5	6	7

The results from these items on the pretraining and posttraining questionnaires are presented in Table 7. Statistical comparisons among the posttraining mean responses (3.44, 3.40, 3.28) yielded no significant differences.

The cadre were asked whether 18 rounds of ammunition were sufficient for zeroing the M16 rifle with either standard ball ammunition or .22 caliber ammunition. The following 7-point scale was used in these items:

Very many more	A good deal more	Slightly more	About right	Slightly less	A good deal less	Very many less
1	2	3	4	5	6	7

The pretraining and posttraining mean responses to these items are displayed in Table 8. A statistical comparison of the posttraining mean responses (3.56, 3.60) yielded no significant difference.

Usage in Marksmanship Fundamentals Training. Both the pretraining and posttraining questionnaires asked the cadre whether they thought that the use of the RFA with .22 caliber ammunition is better or worse for teaching Marksmanship Fundamentals than the use of standard ball ammunition (5.56mm). The following 7-point scale was employed in these items:

Extremely better	Moderately better	Slightly better	About the same	Slightly worse	Moderately worse	Extremely worse
1	2	3	4	5	6	7

Table 7

Type of Ammunition Used During Marksmanship Fundamentals and Zeroing

Question	Mean response		Significant pre/post change
	Pretraining	Posttraining	
How sure are you that a trainee who learns Marksmanship Fundamentals while firing standard ball ammunition (5.56mm) can zero the M16, given 18 rounds of standard ball ammunition (5.56mm)?	3.43	3.44	No
How sure are you that a trainee who learns Marksmanship Fundamentals while firing .22 caliber ammunition can zero the M16 rifle, given 18 rounds of standard ball ammunition (5.56mm)?	3.74	3.40	No
How sure are you that a trainee who learns Marksmanship Fundamentals while firing .22 caliber ammunition can zero the M16 rifle, given 18 rounds of .22 caliber ammunition?	3.71	3.28	No

Table 8

Number of Rounds Used During Zeroing

Question	Mean response: Pretraining	Mean response: Posttraining	Significant pre/post change
In general, do you think that trainees need to fire more or less than 18 rounds of standard ball ammunition (5.56mm) when zeroing the M16 rifle?	3.42	3.56	No
In general, do you think that trainees need to fire more or less than 18 rounds of .22 caliber ammunition when zeroing the M16 rifle with the rimfire adapter with .22 caliber ammunition?	3.48	3.60	No

Respectively, the pretraining and posttraining mean responses to this item were 4.18 and 3.53. A statistical comparison revealed no significant difference between the means.

Remedial or Reinforcement Training During 25-Meter Training. Both the pretraining and posttraining questionnaires queried the cadre concerning how much remedial or reinforcement training trainees who use either 5.56 mm or .22 caliber ammunition will need during 25-meter training (i.e., Marksmanship Fundamentals). The following 5-point scale was employed in these items:

A great deal	Quite a bit	Some	Very little	None
1	2	3	4	5

The results from these items are displayed in Table 9. The posttraining mean responses (2.93, 3.14) to the two items were not significantly different.

Table 9

Amount of Remedial or Reinforcement Training Needed During 25-Meter Training

Question	Mean response		Significant pre/post change
	Pretraining	Posttraining	
How much remedial or reinforcement training do you think that trainees who use 5.56mm ammunition need during 25-meter training?	2.70	2.93	Yes $F(1,66) = 4.54$ $P < .037$
How much remedial or reinforcement training do you think that trainees who use .22 caliber ammunition need during 25-meter training?	2.64	3.14	No

Transfer of Training. The posttraining questionnaire asked the cadre if they thought that trainees can effectively transfer their training with the RFA with .22 caliber ammunition to the firing of an M16 with standard ball ammunition (5.56mm). Eighty-four percent of the respondents indicated "Yes" and 10% "No."

Effect on Motivation. The posttraining questionnaire asked the cadre if they felt that the use of the RFA with .22 caliber ammunition by trainees increased or decreased motivation to perform well during their 25-meter training, as compared with trainees who used 5.56mm ammunition during their 25-meter training. The following 7-point scale was used in this item:

Extremely increased	Moderately increased	Slightly increased	No effect	Slightly decreased	Moderately decreased	Extremely decreased
1	2	3	4	5	6	7

The mean response to this item was 3.79.

Conducting Training. The posttraining questionnaire asked the cadre if they enjoyed training with the RFA with .22 caliber ammunition. Fifty-six percent of the respondents indicated "Yes," 37% indicated "No," and 7% indicated that they "Did not conduct training with the rimfire adapter."

Cadre were also asked if it was easier or harder to conduct training with the RFA with .22 caliber ammunition than it is to conduct training with the M16 using 5.56mm ammunition. The following 7-point scale was used in this item.

Extremely easier	Moderately easier	Slightly easier	No difference	Slightly harder	Moderately harder	Extremely harder
1	2	3	4	5	6	7

The mean response was 3.97.

Characteristics of the Rimfire Adapter. This section describes the cadre's evaluations of a number of firing characteristics of the RFA with .22 caliber ammunition compared to firing characteristics of the M16 rifle with 5.56mm ammunition.

1. Accuracy. The posttraining questionnaire requested the cadre to rate the accuracy of firing the RFA with .22 caliber ammunition at 25-meter targets, as compared with the accuracy when firing the M16 with 5.56mm ammunition. The following 7-point scale was used:

Extremely more accurate	Moderately more accurate	Slightly more accurate	About the same	Slightly less accurate	Moderately less accurate	Extremely less accurate
1	2	3	4	5	6	7

The mean response was 3.86.

2. Aiming Point. The posttraining questionnaire asked the cadre whether you have to aim at the same point on the target with the RFA firing .22 caliber ammunition that you aim at with the M16 rifle firing 5.56mm ammunition. Seventy-two percent of the respondents indicated "Yes," 18% indicated "No," and 10% indicated that they were "Not sure."

3. Difficulty in Zeroing. The posttraining questionnaire asked the cadre to rate the difficulty in zeroing when firing with the RFA with .22 caliber ammunition, as compared with the difficulty in zeroing when firing the M16 with 5.56 ammunition. The following 7-point scale was used:

Extremely less difficult	Moderately less difficult	Slightly less difficult	About the same	Slightly more difficult	Moderately more difficult	Extremely more difficult
1	2	3	4	5	6	7

The mean rating was 3.43. The mean rating was found to be significantly less than a scale value equal to 4 ("About the same") ($t = -3.05$, $df = 41$, $p < .01$).

4. Recoil. The posttraining questionnaire asked the cadre to rate the amount of recoil when firing with the RFA with .22 caliber ammunition, as compared with the amount of recoil when firing the M16 with 5.56mm ammunition, using the following 7-point scale:

Extremely less recoil	Moderately less recoil	Slightly less recoil	About the same	Slightly more recoil	Moderately more recoil	Extremely more recoil
1	2	3	4	5	6	7

The mean rating was 2.35. The mean rating was found to be significantly less than a scale value equal to 4 ("About the same") ($t = -8.92$, $df = 42$, $p < .001$).

5. Noise. The posttraining questionnaire asked the cadre to rate the amount of noise when firing the RFA with .22 caliber ammunition, as compared with the amount of noise when firing the M16 with 5.56mm ammunition, using the following scale:

Extremely less noise	Moderately less noise	Slightly less noise	About the same	Slightly more noise	Moderately more noise	Extremely more noise
1	2	3	4	5	6	7

The mean rating was 2.05. The mean rating was found to be significantly less than a scale value equal to 4 ("About the same") ($t = -8.88$, $df = 42$, $p < .011$).

6. Jamming or Feeding Problems. The cadre were asked if the RFA with .22 caliber ammunition had more jamming or feeding problems than the M16 rifle with 5.56mm ammunition. Twenty-one percent responded "No," 31% responded "Yes, slightly more," 15% responded "Yes, a good deal more," and 33% responded "Yes, very much more."

Recommend Usage. In the posttraining questionnaire the cadre were asked if they would recommend that the RFA with .22 caliber ammunition be used during 25-meter training, including zeroing. Seventy-three percent of the cadre responded "Yes" and 27% "No."

Comments Concerning the Rimfire Adapter. While completing the posttraining questionnaire, the cadre were requested to briefly explain what they liked and disliked about the RFA. They were also requested to explain any advantages and disadvantages of using the RFA with .22 caliber ammunition during 25-meter training rather than an M16 rifle with 5.56mm ammunition. The responses were categorized and tabulated. Responses given by two or more respondents are presented in Table 10.

Table 10

Cadre Comments on Likes and Dislikes About the Rimfire Adapter

Comment	Number of cadre
Likes	
.22 caliber produces less noise	8
.22 caliber ammo more economical	6
Less fear of weapon and stronger tendency to apply BRM skills due to less noise	5
Less recoil with RFA	4
Dislikes	
Too many weapon malfunctions	13
5.56mm ammo more realistic	5

Evaluation of the Rifle Laser

In both the pretraining and posttraining questionnaires, the cadre responded to a number of items pertaining to the design, operation, and usage of the rifle laser.

Usage in Field Fire Training. Both the pretraining and posttraining questionnaires asked the cadre if the use of the RL is better or worse for teaching Field Firing techniques than the use of standard ball ammunition (5.56mm). The following 7-point scale was used in these items:

Extremely better	Moderately better	Slightly better	About the same	Slightly worse	Moderately worse	Extremely worse
1	2	3	4	5	6	7

Respectively, the mean pretraining and posttraining responses to the items were 4.72 and 4.79. A statistical comparison revealed no significant difference in the means.

Usage in Record Fire. Both the pretraining and post training questionnaires asked if the RL is good or bad for use during Record Fire qualification. The following 7-point scale was employed in these items:

Extremely good	Moderately good	Slightly good	Borderline	Slightly bad	Moderately bad	Extremely bad
1	2	3	4	5	6	7

The mean pretraining and posttraining responses to the items were 4.91 and 4.71, respectively. A statistical comparison indicated no significant difference in the means.

Number of Rounds. Both the pretraining and posttraining questionnaires asked the cadre if trainees who fire the RL during the Field Firing need to fire more or fewer rounds than trainees who fire 5.56mm ammunition. The following 7-point scale was used in these items:

Very much more	A good deal more	Slightly more	About the same	Slightly less	A good deal less	Very much less
1	2	3	4	5	6	7

The mean responses to the pretraining and posttraining items were 3.61 and 3.65, respectively. No significant difference was detected between the means.

Remedial or Reinforcement Training. Both the pretraining and posttraining questionnaires asked the cadre to indicate how much remedial or reinforcement training they thought that trainees who use 5.56mm ammunition need during the Field Fire and Record Fire phases of training. The cadre were also asked the same question concerning the use of the RL. The following 5-point scale was used in these items:

A great deal	Quite a bit	Some	Very little	None
1	2	3	4	5

The mean pretraining and posttraining responses for these items are presented in Table 11. A statistical comparison of the two post-training mean responses revealed no significant difference.

Table 11

Amount of Remedial or Reinforcement Training Needed

Type of training	Pretraining	Posttraining	Significant pre/post change
Field Fire and Record Fire with 5.56mm ammo	2.97	3.04	No
Field Fire and Record Fire with the rifle laser	2.51	3.06	Yes $F(1,47) = 8.47$ $p < .005$

In the posttraining questionnaire, the cadre were asked if they would like to use the RL for reinforcement training if scaled-down ranges and targets were available at their unit. Fifty-eight percent of the cadre responded "Yes," 33% "No," and 9% "Not applicable."

Transfer of Training. The posttraining questionnaire asked the cadre if they felt that the trainees can effectively transfer their training with the RL to the firing of an M16 with 5.56mm ammunition. Sixty-four percent of the cadre responded "Yes" and 36% "No."

In both the pretraining and posttraining questionnaires, the cadre were requested to indicate if they thought that trainees who used the RL during the Field Fire and Record Fire phases of training would do better or worse, when firing on a Record Fire range with 5.56mm ammunition, than trainees who had used 5.56mm ammunition during the Field Fire and Record Fire phases of their training. The following 7-point scale was employed in these items:

Extremely better	Moderately better	Slightly better	About the same	Slightly worse	Moderately worse	Extremely worse
1	2	3	4	5	6	7

The pretraining and posttraining mean responses were 4.70 and 4.48, respectively, which were not significantly different. A significant difference was observed between the posttraining mean response and a scale value equal to 4 ("About the same") ($t = -2.54$, $df = 51$, $p < .02$).

Confidence in Hitting Targets. Both the pretraining and posttraining questionnaires asked the cadre to rate how sure they were that a trainee who completes Field Fire and Record Fire using 5.56mm ammunition can hit a man-sized target in daylight with an M16 rifle using 5.56mm ammunition. This question was asked for three different target ranges (25-100 m, 100-200 m, 200-300 m). The cadre were also asked to rate how sure they were that a trainee who completes Field Fire and Record Fire with the RL could hit targets with an M16 rifle using 5.56mm ammunition under the same three target conditions. The following 7-point scale was used in these items:

Extremely sure to hit	Very sure to hit	Fairly sure to hit	Might hit or miss	Fairly sure to miss	Very sure to miss	Extremely sure to miss
1	2	3	4	5	6	7

The mean responses to these pretraining and posttraining items are contained in Table 12. In Table 13, posttraining responses for these items are analyzed. This table compares the confidence expressed by the cadre in those trainees who used the RL during Field Fire and Record Fire training versus those who used the M16 rifle with 5.56mm ammunition.

Conducting Training. The posttraining questionnaire asked the cadre if they felt that the use of the RL by trainees increased or decreased their motivation to perform well during BRM, as compared to the use of the M16 rifle using 5.56mm ammunition. The following 7-point scale was used in this item:

Table 12

Confidence in Hitting Targets

Type of training	Target distances (m)	Mean confidence in hitting targets		Significant pre/post change
		Pretraining	Posttraining	
After completing Field Fire and Record Fire with 5.56mm ammo	25-100	2.45	2.46	No
	100-200	3.67	3.06	No
	200-300	4.04	3.89	No
After completing Field Fire and Record Fire with the rifle laser	25-100	3.03	2.98	No
	100-200	3.55	3.54	No
	200-300	4.22	4.11	No

Extremely increased	Moderately increased	Slightly increased	No effect	Slightly decreased	Moderately decreased	Extremely decreased
1	2	3	4	5	6	7

The mean response was 4.12.

The cadre were also asked if it was easier or harder to conduct training with the RL than it was to conduct training with the M16 using 5.56mm ammunition. The following 7-point scale was employed in this item:

Extremely easier	Moderately easier	Slightly easier	No difference	Slightly harder	Moderately harder	Extremely harder
1	2	3	4	5	6	7

The mean response was 3.89.

Another question asked the cadre if they enjoyed conducting training with the RL. Sixty-three percent of the cadre responded "Yes," 35% "No," and 2% "Did not conduct training with the rifle laser."

Table 13

Posttraining Item Comparisons of Confidence in Hitting Targets

Target distances (m)	Mean confidence in hitting targets (Field Fire and Record Fire)		Significant difference
	M16 with 5.56mm ammo	Rifle laser	
25-100	2.41	2.98	Yes $F(1,50) = 9.11$ $p < .004$
100-200	3.04	3.54	Yes $F(1,51) = 9.34$ $p < .004$
200-300	3.89	4.11	No

Note. Some of the mean response values in this table differ slightly from those in Table 11 because repeated measures, one-way analyses of variance, were employed in constructing this table. Only those individuals who answered each item in a pair of items were included in the analysis.

Characteristics of the Rifle Laser. Within the posttraining questionnaire, a number of items required the cadre to rate how similar various characteristics of the RL are to characteristics of the M16 rifle with 5.56mm ammunition.

1. Accuracy. Cadre were instructed to compare the accuracy of the RL with the accuracy of the M16 rifle when firing with 5.56mm ammunition. The following 7-point scale was used:

Extremely more accurate	Moderately more accurate	Slightly more accurate	About the same	Slightly less accurate	Moderately less accurate	Extremely less accurate
1	2	3	4	5	6	7

The mean response was 3.96.

2. Aiming Point. In a related question the cadre were asked if, in order to hit the target, they had to aim at the same point on the target with the RL as you do the M16 rifle firing 5.56mm ammunition. Fifty-one percent of the cadre asnwered "Yes," 37% "No," and 12% "Not sure."

3. Difficulty in Sighting. The cadre were asked to compare the difficulty in sighting the RL with the difficulty in sighting the M16 rifle when firing 5.56mm ammunition. The following 7-point scale was used in this item:

Extremely less difficult to sight	Moderately less difficult to sight	Slightly less difficult to sight	About the same	Slightly more difficult to sight	Moderately more difficult to sight	Extremely more difficult to sight
1	2	3	4	5	6	7

The mean response was 3.92.

4. Difficulty in Hitting Targets. In the pretraining and posttraining questionnaires the cadre were asked to assess the difficulty of hitting targets with the RL, as compared with the difficulty of hitting targets with the M16 with 5.56mm ammunition. The following 7-point scale was used:

Extremely less difficult	Moderately less difficult	Slightly less difficult	About the same	Slightly more difficult	Moderately more difficult	Extremely more difficult
1	2	3	4	5	6	7

Respectively, the pretraining and posttraining mean responses were 3.91 and 3.63. No significant difference was detected between the two means. A significant difference was observed between the posttraining mean response and a scale value equal to 4 ("About the same") ($t = -2.50$, $df = 50$, $p < .02$).

5. Firing Realism. In both the pretraining and posttraining questionnaires the cadre were requested to indicate whether firing the RL realistically or unrealistically simulates the firing of an M16 rifle with 5.56mm ammunition. The following 7-point scale was used in these items:

Extremely realistic	Moderately realistic	Slightly realistic	Borderline	Slightly unrealistic	Moderately unrealistic	Extremely unrealistic
1	2	3	4	5	6	7

The mean responses to the pretraining and posttraining items were 5.51 and 5.00, respectively. The posttraining mean response was significantly lower than the pretraining mean response ($F(1,47) = 7.66$, $p < .008$).

6. Trigger Squeeze. The cadre were asked if, because of differences in the trigger squeeze between the RL and the M16 rifle when firing 5.56mm ammunition, training with the RL made it harder to fire the M16 rifle with ball ammunition. Forty-one percent of the cadre responded "Yes," 31% responded "No," and 28% responded "Not sure."

7. Weight. The cadre were instructed to compare the weight of the RL to the weight of the M16 rifle with 5.56mm ammunition, using the following 7-point scale:

Extremely lighter	Moderately lighter	Slightly lighter	About the same	Slightly heavier	Moderately heavier	Extremely heavier
1	2	3	4	5	6	7

The mean response was 3.55. This mean was significantly less than a scale value equal to 4 ("About the same") ($t = -3.92$, $df = 50$, $p < .001$).

8. Balance. The cadre were requested to compare the balance of the RL with the balance of the M16 with 5.56mm ammunition, using the following 7-point scale:

Extremely better balance	Moderately better balance	Slightly better balance	About the same	Slightly worse balance	Moderately worse balance	Extremely worse balance
1	2	3	4	5	6	7

The mean response was 4.04.

Recommend Usage. In the posttraining questionnaire the cadre were asked if they would recommend that the RL be used during Field Fire training. Fifty-seven percent of the cadre indicated "Yes" and 43% "No." They were also asked if they would recommend that the RL be used during Record Fire qualification. Thirty-eight percent of the cadre responded "Yes," and 62% "No."

Comments Concerning the Rifle Laser. While completing the posttraining questionnaire, the cadre were requested to respond to four open-ended items that addressed their likes and dislikes concerning the RL, possible design improvements, motivational problems associated with using the RL, and the sighting and accuracy of the RL. The tabulations presented in Tables 14-17 include only comments made by two or more cadre members.

The cadre were asked to briefly explain what they liked and/or disliked about the RL and to explain any advantages and/or disadvantages of using the RL during the Field Fire and Record Fire phases of training rather than the M16 rifle with 5.56mm ammunition. Their responses are presented in Table 14.

Table 14

Cadre Comments on Likes and Dislikes
About the Rifle Laser

Comment	Number of cadre
Likes	
Quieter	11
Economical	4
Safer	3
Helps trainee gain confidence in weapon	3
Dislikes	
Unrealistic--no recoil and/or noise	16
Trainee unable to determine where a "miss" struck	8
Trainees less safety conscious	5
Trainee unable to practice immediate action steps due to lack of chambered rounds	3
Unable to determine weapon malfunction	2
Targets required frequent repair resulting in lost time	2
Malfunctioned in rainy weather	2
Initial shock of firing 5.56mm ammo	2
Noise and recoil major factor with female trainees. (If cadre learn to fire with laser, they lose acquired skills when transition to ball is effected.)	2

The cadre were requested to briefly explain any design improvements which they would recommend for the RL. Their recommendations are displayed in Table 15.

Table 15

Cadre Comments on Recommend Improvements for the Rifle Laser

Recommendation	Number of cadre
Make lower receiver stronger	4
Improve to enable trainee to fire during inclement weather (e.g., rain)	2
Add movable charging handle	2
Add noise and recoil	2
Change position of counter on weapon (present position hinders trainee in effecting prone position)	2

The cadre were asked if training with the RL created any motivational problems for trainees and if they observed any careless handling or use of the RL. These comments are presented in Table 16.

Finally the cadre were requested to describe the sighting and accuracy of the RL as compared with the M16 rifle with 5.56mm ammunition. They were also asked whether the same sight picture is required with the RL and the M16 rifle using 5.56mm ammunition. They were also asked to describe any problems with the RL. Their comments to these questions are presented in Table 17.

Table 16

Cadre Comments on Rifle Laser Motivational and Handling Problems

Comment	Number of cadre
Troops were not mindful of safety precautions	17
No problem, trainees were motivated	5
Do not feel trainee learns basics of firing weapon with the rifle laser	4
Trainees did not know how to correct their fire when they missed	2

Table 17

Cadre Comments on Use of the Rifle Laser

Comment	Number of cadre
Sight picture same or comparable	12
The aiming point was different for the rifle laser at distant targets	5
Laser more accurate, sight picture is in center of target while it is necessary with M16 to obtain varying sight pictures depending on the range to the target	2

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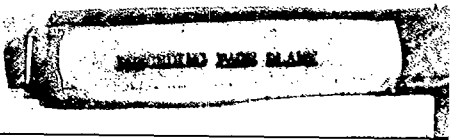

ARI Distribution List

4 OASD (M&RA)
2 HQDA (DAMI-CSZ)
1 HQDA (DAPE-PBR
1 HQDA (DAMA-AR)
1 HQDA (DAPE-HRE-PO)
1 HQDA (SGRD-ID)
1 HQDA (DAMI-DOT-C)
1 HQDA (DAPC-PMZ-A)
1 HQDA (DACH-PPZ-A)
1 HQDA (DAPE-HRE)
1 HQDA (DAPE-MPO-C)
1 HQDA (DAPE-DW)
1 HQDA (DAPE-HRL)
1 HQDA (DAPE-CPS)
1 HQDA (DAFD-MFA)
1 HQDA (DARD-ARS-P)
1 HQDA (DAPC-PAS-A)
1 HQDA (DUSA-OR)
1 HQDA (DAMO-RQR)
1 HQDA (DASG)
1 HQDA (DA10-PI)
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1 Mil Asst, Hum Res, ODDR&E, OAD (E&LS)
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1 HQ First Army, ATTN: AFKA-OI-TI
2 HQ Fifth Army, Ft Sam Houston
1 Dir, Army Stf Studies Ofc, ATTN: OAVCSA (DSP)
1 Ofc Chief of Stf, Studies Ofc
1 DCSPER, ATTN: CPS/OCP
1 The Army Lib, Pentagon, ATTN: RSB Chief
1 The Army Lib, Pentagon, ATTN: ANRAL
1 Ofc, Asst Sect of the Army (R&D)
1 Tech Support Ofc, OJCS
1 USASA, Arlington, ATTN: IARD-T
1 USA Rsch Ofc, Durham, ATTN: Life Sciences Dir
2 USARIEM, Natick, ATTN: SGRD-UE-CA
1 USATTC, Ft Clayton, ATTN: STETC-MO-A
1 USAIMA, Ft Bragg, ATTN: ATSU-CTD-OM
1 USAIMA, Ft Bragg, ATTN: Marquat Lib
1 US WAC Ctr & Sch, Ft McClellan, ATTN: Lib
1 US WAC Ctr & Sch, Ft McClellan, ATTN: Tng Dir
1 USA Quartermaster Sch, Ft Lee, ATTN: ATSM-TE
1 Intelligence Materiel Dev Ofc, EWL, Ft Holabird
1 USA SE Signal Sch, Ft Gordon, ATTN: ATSO-EA
1 USA Chaplain Ctr & Sch, Ft Hamilton, ATTN: ATSC-TE-RD
1 USATSCH, Ft Eustis, ATTN: Educ Advisor
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1 DLI, SDA, Monterey
1 USA Concept Anal Agcy, Bethesda, ATTN: MOCA-WGC
1 USA Concept Anal Agcy, Bethesda, ATTN: MOCA-MR
1 USA Concept Anal Agcy, Bethesda, ATTN: MOCA-JF
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1 USA Artic Test Ctr, APO Seattle, ATTN: AMSTE-PL-TS
1 USA Armament Cmd, Redstone Arsenal, ATTN: ATSK-TEM
1 USA Armament Cmd, Rock Island, ATTN: AMSAR-TDC
1 FAA-NAFEC, Atlantic City, ATTN: Library
1 FAA-NAFEC, Atlantic City, ATTN: Hum Engr Br
1 FAA Aeronautical Ctr, Oklahoma City, ATTN: AAC-44D
2 USA Fld Arty Sch, Ft Sill, ATTN: Library
1 USA Armor Sch, Ft Knox, ATTN: Library
1 USA Armor Sch, Ft Knox, ATTN: ATSB-DI-E
1 USA Armor Sch, Ft Knox, ATTN: ATSB-DT-TP
1 USA Armor Sch, Ft Knox, ATTN: ATSB-CD-AD
2 HQUSACDEC, Ft Ord, ATTN: Library
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2 USAEEC, Ft Benjamin Harrison, ATTN: Library
1 USAPACDC, Ft Benjamin Harrison, ATTN: ATCP-HR
1 USA Comm-Elect Sch, Ft Monmouth, ATTN: ATSN-EA
1 USAEC, Ft Monmouth, ATTN: AMSEL-CT-HDP
1 USAEC, Ft Monmouth, ATTN: AMSEL-PA-P
1 USAEC, Ft Monmouth, ATTN: AMSEL-SI-CB
1 USAEC, Ft Monmouth, ATTN: C, Facl Dev Br
1 USA Materiels Sys Anal Agcy, Aberdeen, ATTN: AMXSY-P
1 Edgewood Arsenal, Aberdeen, ATTN: SAREA-BL-H
1 USA Ord Ctr & Sch, Aberdeen, ATTN: ATSL-TEM-C
2 USA Hum Engr Lab, Aberdeen, ATTN: Library/Dir
1 USA Combat Arms Tng Bd, Ft Benning, ATTN: Ad Supervisor
1 USA Infantry Hum Rsch Unit, Ft Benning, ATTN: Chief
1 USA Infantry Bd, Ft Benning, ATTN: STEBC-TE-T
1 USASMA, Ft Bliss, ATTN: ATSS-LRC
1 USA Air Def Sch, Ft Bliss, ATTN: ATSA-CTD-ME
1 USA Air Def Sch, Ft Bliss, ATTN: Tech Lib
1 USA Air Def Bd, Ft Bliss, ATTN: FILES
1 USA Air Def Bd, Ft Bliss, ATTN: STEBD-PO
1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: Lib
1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: ATSW-SE-L
1 USA Cmd & General Stf College, Ft Leavenworth, ATTN: Ed Advisor
1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: DepCdr
1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: CCS
1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: ATCASA
1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: ATCACO-E
1 USA Combined Arms Cmbt Dev Act, Ft Leavenworth, ATTN: ATCACC-CI
1 USAECOM, Night Vision Lab, Ft Belvoir, ATTN: AMSEL-NV-SD
3 USA Computer Sys Cmd, Ft Belvoir, ATTN: Tech Library
1 USAMERDC, Ft Belvoir, ATTN: STSFB-DQ
1 USA Eng Sch, Ft Belvoir, ATTN: Library
1 USA Topographic Lab, Ft Belvoir, ATTN: ETL-TD-S
1 USA Topographic Lab, Ft Belvoir, ATTN: STINFO Center
1 USA Topographic Lab, Ft Belvoir, ATTN: ETL-GSL
1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: CTD-MS
1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATS-CTD-MS
1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: ATSI-TE
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1 USA Intelligence Ctr & Sch, Ft Huachuca, ATTN: Library
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1 CDR, Project MASSTER, ATTN: Tech Info Center
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1 Stimson Lib, Academy of Health Sciences, Ft Sam Houston
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2 USCG Academy, New London, ATTN: Admission
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1 US Marine Corps Liaison Ofc, AMC, Alexandria, ATTN: AMCGS-F
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6 USATRADOC, Ft Monroe, ATTN: ATPR-AD
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1 USA Forces Cmd, Ft McPherson, ATTN: Library
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1 USA Aviation Sch, Ft Rucker, ATTN: PO Drawer O
1 HQUSA Aviation Sys Cmd, St Louis, ATTN: AMSAV-ZDR
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1 USA Aviation Sch, CO, Ft Rucker, ATTN: ATST-D-A
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1 HQ, USAMC, Alexandria, ATTN: CDR
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1 US Military Academy, West Point, ATTN: Ofc of Milit Ldrshp
1 US Military Academy, West Point, ATTN: MAQR
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1 Ofc of Naval Rsch, Arlington, ATTN: Code 452
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1 Naval Aerospc Med Res Lab, Pensacola, ATTN: Acous Sch Div
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1 AFHRL (AS) WPAFB, OH
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1 AFHRL (DOJN) Lackland AFB
1 HQUSAF (INYSD)
1 HQUSAF (DPXXA)
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1 NavPostGraSch, Monterey, ATTN: Code 2124
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